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| 09/697,389 | 10/26/2000 | Raoul Florent | PHF 99,595 | 4651 |

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EXAMINER

AKHAVANNIK, HUSSEIN

ART UNIT PAPER NUMBER

2621

DATE MAILED: 11/07/2003

10

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/697,389

Applicant(s)

FLORENT ET AL.

Examiner

Hussein Akhavannik

Art Unit

2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 October 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 9.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:
 - a. On page 1, the "Summary of the Invention" should be moved from before line 9 to before line 20 as the explanation of U.S. Patent No. 5,809,105 is explaining background art.
 - b. On page 1, line 10, "US Patent N°" should be changed to "US Patent No".
 - c. On page 2, line 22, the amendment filed October 26, 2000 (now paper No. 8) states "carrying out a method as claimed in claim 1". The reference to "claim 1" should be removed as the claim numbers can change during prosecution.
 - d. On page 3, the "Description of the Preferred Embodiments" should be moved from between lines 30 and 31 to before line 5 as the "Brief Description of the Drawings" end at line 3.
 - e. On page 5, line 9, "extracted in one image" should be changed to "extracted one image".
 - f. On page 5, line 15, "in" should be changed to "In".

Appropriate correction is required.

Drawings

2. The drawings are objected to because figures 4A and 4B do not contain descriptive labels. For example, reference number 150 in figure 4A should be labeled "Medical Examination Apparatus" as explained on page 11, line 32 of the specification. A proposed

Art Unit: 2621

drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Allowable Subject Matter

3. Claims 5-7 and 12 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 4-7 and 12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Referring to claim 4, "the first and the second control binary signals" lack antecedent basis in claims 1, 2, and 3.

Referring to claims 5-7 and 12, these claims are indefinite for depending from an indefinite antecedent base claim.

Double Patenting

6. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground

Art Unit: 2621

provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. Claims 1-4 and 8-11 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 3, 4, 9, and 10 of U.S. Patent No. 6,574,300 (herein Florent et al) in view of Zarge et al (U.S. Patent No. 5,289,373).

Referring to claim 1,

- i. Extracting the threadlike structure points corresponds to claim 1 of Florent et al by the “the step of extraction of the threadlike structure”. Though Florent et al do not explicitly explain extracting points, Zarge et al illustrate that a threadlike structure of a catheter contains a multitude of points in figure 7. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to extract threadlike structure points in order to create a threadlike structure as the medical images of Florent et al and Zarge et al are digital and thus composed of pixels (or points).
- ii. Forming strings from the extracted points corresponds to claim 1 of Florent et al by the “the step of extraction of the threadlike structure”. Though Florent et al do not explicitly explain forming strings, Zarge et al illustrate that the structure points are joined to form chains (or strings) in figure 7. A string of points in a digital image corresponds to a threadlike structure as claimed by Florent et al in claim 1. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form strings from the extracted structure points in order to create a threadlike structure as the

medical images of Florent et al and Zarge et al are digital and thus composed of pixels (or points).

iii. Temporally filtering the data of the points located outside the strings denoted background points corresponds to claim 1 of Florent et al by the “temporally filtered pixel values of the second original image” and further by the “temporally filtered pixel value as a background pixel value”. The temporal filtering of the present invention is performed on the background points and the string points as illustrated in figure 1. The input of the temporal filter TPRF (30) is the complete input image X_t or X_{t-1} (100), which contains both string points and background points. Therefore, by temporally filtering the pixel values of the second original image (corresponding to X_t), Florent et al are temporally filtering the data of the points located outside the strings.

iv. Spatially filtering the data of the string points corresponds to claim 1 of Florent et al by the “spatially filtered pixel value as a threadlike-structure filtered pixel value”.

Thus, the spatially filtered points of Florent et al are the string points.

v. Constructing the filtered second image data by performing an insertion of the spatially filtered data of the string points into the temporally filtered data of the background points corresponds to claim 1 of Florent et al by the “step of pixel value selection based on said binary mask image pixel values for producing respectively, as a finally filtered pixel value”. The final pixel value that constitutes part of the filter second image is selected from either a temporally filtered pixel value representing a background pixel or a spatially filtered pixel representing a threadlike-structure pixel. Therefore, by

Art Unit: 2621

selecting the both spatially and temporally filtered pixels, the spatially filtered pixels are inserted into the temporally filtered pixels.

Referring to claim 2, providing a binary control signal formed of a list of the string points with their running number on the strings and their co-ordinates in the processed image, which determines whether the current point is a string point or a non-string point regarded as a background point corresponds to claim 3 of Florent et al. Florent et al select the pixel value (temporally filtered which corresponds to a background pixel or spatially filtered which corresponds to a thread-like structure pixel corresponding to claim 1iii and 1iv above) according to a binary control signal value at the current pixel location, which is inherently determined by the pixel co-ordinate. A running number on the strings is not explicitly explained by Florent et al, however, Zarge et al illustrate the running number of thread-like structures defined by strings of pixels in figure 7. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the running number of the string points in the binary control signal of Florent et al in order to connect the pixels of a string in the correct sequence, thereby assuring an accurate thread-like structure.

Referring to claim 3, supplying the binary control signal for controlling the insertion of the spatially filtered data of the string points into the temporally filtered data of the background points corresponds to claim 3 of Florent et al. Insertion of the spatially filtered data into the temporally filtered data corresponds to claim 1v above. Florent et al further explain in claim 3 that the pixel value selection is determined according to the binary control signal.

Referring to claim 4, delivering the binary control signal for controlling the insertion operation through a logic OR operation, whose inputs are the first and the second control binary

Art Unit: 2621

signals related to the first and the second sequence images, the OR operation triggering the spatially filtered data when at least one of the two binary control signals corresponds to a string point corresponds to claim 4 of Florent et al. Florent et al explain using a logic OR operation to select the pixel value according to the control binary signals of the first and second binary mask image.

Referring to claim 8, the images being medical examination digital images and the thread-like structure being a catheter guide wire is not explicitly explained by Florent et al. However, Zarge et al do explain the images being medical images and the thread-like structure being a catheter guide wire in the abstract. It would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the threadlike structure of a catheter guide wire in order to accurately display the guide to a physician for real-time tracking.

Referring to claim 9, this claim corresponds to claim 10 of Florent et al wherein all the limitations of this claim are represented by claim 1.

Referring to claim 10, the X-ray apparatus having access to the medical image data for processing the medical image data corresponds to claim 10 of Florent et al wherein the apparatus acquires "a pixel value at a current pixel location in a first and a second successive original image of the sequence".

Referring to claim 11, this claim corresponds to claim 9 of Florent et al wherein all the limitations of this claim are represented by claim 1 above.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 2621

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1-3 and 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aufrichtig et al (Aufrichtig, R., Wilson, D.L.; X-ray Fluoroscopy Spatio-Temporal Filtering with Object Detection, Medical Imaging, IEEE Transactions on , Volume: 14 Issue: 4 , Dec. 1995, Page(s): 733 –746) in view of Zerge et al.

Referring to claim 1, which is representative of claims 9 and 11,

i. Extracting the threadlike structure points is explained by Aufrichtig et al on page 734, second column, sixth paragraph to page 736, first column, second paragraph and illustrated in figure 2 by the matched filter. The match filtering detects and roughly segments the line-like structures, which represent the catheter guide, wire as explained by Aufrichtig et al on page 734, second column, second paragraph. The result of the matched filter is a likelihood image containing line-like structures.

ii. Forming strings from the extracted points is not explicitly explained by Aufrichtig et al. Though Aufrichtig et al do explain that the extracted points will exhibit line-like structures on page 734, second column, fifth paragraph, they do not explicitly explain forming strings from the extracted points. However, Zarge et al illustrate that the structure points are joined to form chains (or strings) in figure 7. A string of points in a digital image corresponds to a threadlike structure as explained by Aufrichtig et al.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form strings from the extracted structure points in order to create a

threadlike structure as the medical images of Aufrichtig et al and Zarge et al are digital and thus composed of pixels (or points).

iii. Temporally filtering the data of the points located outside the strings denoted background points is explained by Aufrichtig et al on page 736, second column, first paragraph to page 737, first column, third paragraph. The temporal filtering of Aufrichtig et al is applied to an entire input medical image. However, the temporal filtering of the present invention is performed on the background points and the string points as illustrated in figure 1. The input of the temporal filter TPRF (30) is the complete input image X_t or X_{t-1} (100), which contains both string points and background points.

Therefore, by temporally filtering all the pixel values of an input medical image, Aufrichtig et al are temporally filtering the data of the points located outside the strings.

iv. Spatially filtering the data of the string points is explained by Aufrichtig et al on page 736, first column, third to fifth paragraphs. Aufrichtig et al explain that the filtering is performed on the pixels of the object-likelihood image and therefore, the string points.

v. Constructing the filtered second image data by performing an insertion of the spatially filtered data of the string points into the temporally filtered data of the background points is illustrated by Aufrichtig et al in figure 1. The spatially filtered pixels and the temporally filtered pixels are combined to form the enhanced image sequence.

Referring to claim 2, providing a binary control signal formed of a list of the string points with their running number on the strings and their co-ordinates in the processed image, which determines whether the current point is a string point or a non-string point regarded as a

Art Unit: 2621

background point is not explicitly explained by Aufrichtig et al. Though Aufrichtig et al do provide an object-likelihood image, which acts as a binary signal by identifying the probably object pixels (wherein each pixel is inherently associated with a co-ordinate), Aufrichtig et al do not explicitly explain providing the running number of the string points and their co-ordinates. However, Zarge et al illustrate the running number of thread-like structures defined by strings of pixels in figure 7. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include the running number of the string points in the object-likelihood image of Aufrichtig et al in order to connect the pixels of a string in the correct sequence, thereby assuring an accurate thread-like structure.

Referring to claim 3, supplying the binary control signal for controlling the insertion of the spatially filtered data of the string points into the temporally filtered data of the background points corresponds is illustrated by Aufrichtig et al in figure 1. Aufrichtig et al illustrate that the object likelihood image (corresponding to the binary control signal) is used to create the enhanced image sequence and therefore, the binary control signal is supplied to control the insertion of the spatially filtered data into the temporally filtered data.

Referring to claim 8, the images being medical examination digital images and the thread-like structure being a catheter guide wire is explained by Aufrichtig et al in the abstract.

Referring to claim 10, the X-ray apparatus having access to the medical image data for processing the medical image data is illustrated by Aufrichtig et al in figure 1 by the noisy image sequence being input into the system.

Art Unit: 2621

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Honda et al (U.S. Patent No. 6,161,178) – To exhibit determining the structure of a catheter guide wire by using a high pass filter and subtracting the structure from a medical image to enhance the structure as illustrated in figure 6 and explained in column 8, lines 48-68.

Roehm et al (U.S. Patent No. 5,809,105) – To exhibit using a mask to spatially filter background pixels of a medical image in order to emphasize structural pixels as explained in column 3, line 51 to column 4, line 67.


11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hussein Akhavannik whose telephone number is (703)306-4049. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H. Boudreau can be reached on (703)305-4706. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)305-3900.

Hussein Akhavannik
October 28, 2003

A.A.


LEO BOUDREAU
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